

- 11 -

Claims

1. Variable valve lift control system for a combustion engine with underneath camshaft for the adjustment of a valve lift and of an opening time of at least one inlet valve and/or outlet valve load-dependently and rotational speed-dependently as well as for the switch-off of individual cylinders of an internal combustion engine, whereby rocker levers or swing arms, which are driven by means of cams of a camshaft, actuate the inlet valve and outlet valve by means of the engagement into further rocker levers or swing arms, characterized in that an underneath camshaft (1) drives by means of a push rod (3) via a hydraulic valve clearance adjustment element (2) a rocker lever (4), which has a curve contour (14), which runs on a roller (13) of an intermediate lever (9), which is moveable by means of two rollers (15), which are arranged on one axis, in slotted links (10), which are connected in a fixed manner with a cylinder head, whereby the intermediate lever (9) supports with a contour at an adjustment bar (11), which is conducted within a housing, and rolls with a work curve (16) on a roller (8) of a cam follower (7), and whereby the cam follower (7) acts with engagement areas, which are provided bottom-sided, respectively, on a hydraulic adjustment element (6) and a valve (5) of a combustion engine.
2. Variable valve lift control system according to claim 1, characterized in that by means of a shift of the adjustment bar (11), the region of the work curve (16) of the intermediate lever (9) is adjusted, which is applied with the roller (8) of the cam follower (7) in a rotation of the camshaft (1).
3. Variable valve lift control system according to claim 1 and 2, characterized in that the work curve (16) of the intermediate lever (9) is constructed

- 12 -

from several individual regions, which are connected with each other by means of transition radii.

4. Variable valve lift control system according to claim 3, characterized in
5 that the individual regions are constructed in such a manner that a first region determines a zero-lift, which is defined by means of a circular arc around the center of the roller (13), at it following a second region, which defines the opening ramp, and at it following a part-lift region and a full-lift region.
- 10 5. Variable valve lift control system according to claim 3 and 4, characterized in that a spline is laid over the total curve region (16) in order to connect the curve regions with each other without a shock.
- 15 6. Variable valve lift control system according to any one of the claims 1 to 5, characterized in that by means of an embossment of the camshaft (1), by means of the curve contour (14) of the rocker lever (4) and by means of the work curve (16) of the intermediate lever (9) the opening characteristic of the valve is determinable.
- 20 7. Variable valve lift control system according to any one of the claims 1 to 6, characterized in that the work curve (16) is arranged on the cam follower (7) and that the roller (8) is constituent part of the intermediate lever (9).
- 25 8. Variable valve lift control system according to any one of the claims 1 to 7, characterized in that the rocker lever (4) has an additional roller (12), which is in direct connection with the roller (13) of the intermediate lever (9), which runs at the slotted link (10) of the rocker lever (4).
- 30

- 13 -

9. Variable valve lift control system according to any one of the claims 1 to 8, characterized in that the intermediate lever (9) is conducted axially through a leg spring (17) or through a slotted link (10) with a lateral line (21).
- 5 10. Variable valve lift control system according to any one of the claims 1 to 9, characterized in that the intermediate lever (9) supports with a circular contour (19) at the adjustment bar (11).
- 10 11. Variable valve lift control system according to any one of the claims 1 to 9, characterized in that the intermediate lever (9) supports with a circular contour (19) on a roller, which is bedded in a friction bearing or anti-friction bearing.
- 15 12. Variable valve lift control system according to any one of the claims 1 to 11, characterized in that the adjustment bar (11) has a contact contour (20), in particular circular arc-shaped, concave, ascending and sloping.
- 20 13. Variable valve lift control system according to any one of the claims 1 to 12, characterized in that for internal combustion engines with several inlet valves and outlet valves the control of the valves with different valve lifts and coupled therewith with different opening times takes place by means of several adjustment bars (11), which are adjustable by means of individual actuators, and whereby the corresponding set value is calculated by means of a process-controlled engine characteristic or by means of a program-controlled model.
- 25 14. Variable valve lift control system according to any one of the claims 1 to 13, characterized in that for Otto engines and Diesel engines by means of an individual control of the valve lift of in particular two inlet valves the twist of the in-cylinder flow is adjustable.
- 30

- 14 -

15. Variable valve lift control system according to any one of the claims 1 to 14, characterized in that the adjustment element (6) is omitted.
- 5 16. Variable valve lift control system according to any one of the claims 1 to 14, characterized in that no valve clearance adjustment element (2) is provided.
- 10 17. Variable valve lift control system according to any one of the claims 1 to 16, characterized in that the intermediate lever (9) is formed from aluminum or from titanium alloy.
- 15 18. Variable valve lift control system according to any one of the claims 1 to 17, characterized in that the rollers (8, 12, 13, 15) are bedded in anti-friction bearings.
19. Variable valve lift control system according to any one of the claims 1 to 17, characterized in that the rollers (8, 12, 13, 15) are bedded in anti-friction bearings and friction bearings.
- 20 20. Variable valve lift control system according to any one of the claims 1 to 19, characterized in that the rocker lever (4) is bedded in an anti-friction bearing or a friction bearing.
- 25 21. Variable valve lift control system according to any one of the claims 1 to 20, characterized in that no adjustment elements (2, 6) are provided, whereby the valve clearance is mechanically adjustable at the rocker lever (4).